faced into the mass filter. Furthermore it will be appreciated that the ion axis of the mass filter and the ion may be co-linear. It will therefore be appreciated that this invention may be used in conjunction with such a mass filter, acting to transport ions to the mass filter for analysis, and could be fabricated on the same base substrate such that an integrated devices is formed. An ion guide provided in accordance with the teaching of the invention could of course be used in conjunction with other types of mass filters including those not based on quadrupole configurations.

[0041] FIG. **7** shows however an example of a microengineered ion guide **701** and a microengineered electrostatic quadrupole mass filter **702** located on a common substrate **703**, according to the teaching of the invention. The quadrupole lens which is used in the formation of the mass filter is also fabricated in two halves that are assembled by stacking. Each half of the quadrupole lens is constructed by inserting two cylindrical conducting electrode rods **704***a* and **704***b* into pairs of etched, metallized features **705***a*, **705***b* and **706***a*, **706***b* that provide mechanical mounts for and electrical connections to the rods. The electrode rods straddle an etched, metallized trench **707** formed in a raised feature **708**. A detailed description of such an arrangement is provided in GB 0701809.6, the content of which is incorporated herein by way of reference.

[0042] When the structure is assembled, the pairs of rods on each substrate combine to form a quadrupole electrode arrangement, while the raised features **708** in the two halves of the structure combine to provide both a mechanical spacer between the substrates and a surrounding shield for the quadrupole.

[0043] By extension of the same teachings, a short RF-only quadrupole, which is not shown here, may be interposed between the ion guide and the quadrupole mass filter to act as a quadrupole ion guide pre-filter. Similarly, a short RF-only quadrupole, which is again not shown, may be provided after the quadrupole mass filter to act as a quadrupole ion guide post-filter. Alternatively, a further stacked ring ion guide may be provided after the quadrupole mass filter to transport ions elsewhere for further processing.

[0044] From these examples, it will be apparent to the person skilled in the art that following the teaching of the invention that many useful combinations of stacked ring ion guide, quadrupole ion guide and quadrupole filter may be formed. In each case, one advantage of the stacked construction is the ease with which apparently dissimilar components may be combined. A further advantage is the ease with which the ion axis may be located at a common distance from each substrate, enabling low-loss ion transmission between components. By forming such devices from first and second substrates that are then mated to one another to form the final sandwich structure, it is possible to provide highly integrated arrangements using common fabrication techniques.

[0045] It will also be apparent to the person skilled in the art that following the teaching of the invention that there will be occasions when a common substrate format is advantageous, for example in a low cost disposable arrangement. Conversely, there will also be occasions when it will be desirable to form the components on separate substrates, for example to allow a contaminated quadrupole mass filter to be removed and replaced without disturbing the ion guide. In this way it will be understood that the teaching of the invention is not to be construed in any way limiting except as may be deemed necessary in the light of the appended claims.

[0046] When placed in a region of intermediate pressure located at the output of a first mass filter, an ion guide provided in accordance with the teaching of the invention may additionally provide an ion fragmentation function, acting to transport fragments of ions selected by the first mass filter to a second mass filter for analysis.

[0047] It will be further appreciated that some applications may require the use of DC voltages in addition to AC voltages, or the use of DC voltages instead of AC voltages in a DC ion guide. These voltages may be provided without modification to the structure described thus far. It will also be appreciated that some applications may require completely a different voltage to be applied to each electrode. These voltages may be provided by omitting the bus bars interconnecting the electrode sets as shown in FIG. **4**, and forming separate wire bond connections to each electrode.

[0048] An ion guide provided in accordance with the teaching of the invention may be provided with a unique identifier to assist in a subsequent tracking of the ion guide for one of a number of different purposes. Such provision of a unique identifier may be in the form of a storeable numeric or alphanumeric indicia that is uniquely associatable with the ion guide and that may be subsequently used in establishing usage of that ion guide. The indicia may be stored in an EPROM or other memory storage device that is externally accessible by a third party or device. It will be understood that the decision on the optimum type of identifier chosen will be dependent on the operating conditions of the ion guide, in that the reading of the identifier should not prejudice the operation of the ion guide. An example of how personalization may be achieved in a mass analysis environment is described in our co-pending U.S. application Ser. No. 11/711,142, the content of which is incorporated herein by reference. Techniques used in this disclosure may be equally applicable within the context of personalization of devices provided in accordance with the teaching of the present invention.

[0049] It will be understood that what has been described herein is an exemplary method of fabricating a micro-engineered ion guide. By forming the features of the ion guide in two separate substrates and then bringing the substrates together in a sandwich structure it is possible to fabricate a number of adjacent electrodes, each having an aperture defined thereon. Alignment of the apertures and application of appropriate voltages to adjacent electrodes effects the formation of an ion guide. What has also been described is a combined ion guide mass spectrometer arrangement which may be fabricated on a common substrate. While the teaching of the invention has been described with reference to exemplary embodiments thereof it will be understood that such exemplary embodiments while being useful in an understanding of the teaching of the invention are not intended to limit the invention in any way except as may be deemed necessary in the light of the appended claims. Features described with reference to one or more of the accompanying figures could be used with or interchanged with those of others of the Figures without departing from the scope of the invention.

[0050] There are therefore many processes that achieve a similar objective.

[0051] Within the context of the present invention the term microengineered or microengineering or microfabricated or microfabrication is intended to define the fabrication of three dimensional structures and devices with dimensions in the order of microns. It combines the technologies of microelectronics and micromachining. Microelectronics allows the